AN ADDRESS DELIVERED BY THE EXECUTIVE DIRECTOR OF THE AFRICAN REGIONAL CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN ENGLISH, DR GANIY AGBAJE, AT THE OPENING CEREMONY OF THE INTERNATIONAL TRAINING WORKSHOP ON GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) HOLDING ON 8 – 13 AUGUST 2016, AT RECTAS AUDITORIUM, OBAFEMI AWOLOWO UNIVERSITY (OAU), CAMPUS, ILE-IFE, OSUN STATE, NIGERIA

The Chairman, Honourable Minister of Science & Tech, Dr. Ogbonnaya Onu,

The Chief Host, Vice-Chancellor, OAU, Ile-Ife, Professor Anthony Elujoba,

The DG OF NASRDA, Professor S.O Mohammed,

Guest Speaker, Prof. Jide Kufoniyi,

Principal Officers of the University,

Deans of Faculties and Heads of Departments,

Resource Person,

Distinguished guests,

Ladies and gentlemen

It is with great pleasure that I welcome you all to this 1-week International Training Workshop on Global Navigation Satellite Systems (GNSS) jointly organised by the African Regional Centre for Space Science and Technology Education in English (ARCSSTEE) of Nigeria and the Regional Centre for Space Science and Technology Asia-Pacific (RCSSTAP) of China in collaboration with Beihang University, China.

The Global Navigation Satellite System (GNSS) is a space-based radio positioning system that includes one or more satellite constellations, augmented as necessary to support the intended operation, and it provides 24-hour three-dimensional position, velocity and time information to suitably equipped users anywhere on, or near the surface of the earth. GNSS is a generic term covering a number of existing and planned constellations of satellites together with supporting infrastructure systems, used for determining positions across the globe (Dodo, 2010). Existing systems include the Global Positioning System (GPS) of the USA (24satellites), the Global Orbiting Navigation Satellite System (GLONASS) of the

Russian Federation (24 satellites), the planned European Galileo system (more than 27 satellites) and the Chinese Beidou (planned to extend coverage to Africa).

The use of the signals received from the existing global navigation satellite systems has become a cross cutting tool to support high-level research and sophisticated applications whose results are greatly enhanced by accurate determination of timing and position of events. Satellite navigation and positioning data are now used in wide range of areas that include mapping and surveying, monitoring of the environment, precision agriculture and natural resources management, disaster warning and emergency response, aviation, maritime, land transportation and research areas such as climate change and ionosphere studies.

The African Regional Center for Space Science and Technology Education in English (ARCSSTE-E) is a UN-OOSA affiliated centre located in OAU, Ile-Ife, Nigeria remains committed to the implementation of the UN mandate on building indigenous capacity in Space Science and Technology (SST) applications in English speaking African countries through a 9-month PGD and 18 months MTech. (in collaboration with Federal University of Technology, Akure (FUTA)) programmes in four basic areas viz; Remote Sensing and GIS Satellite Communication, Satellite Meteorology and Basic and Atmospheric Sciences, and GNSS. The Center is also responsible for creating awareness to the general public and to popularise space science education in primary and secondary schools via the organisation of space education workshops and outreach programmes. Similar outreaches and campaigns in member states' embassies and high commissions in Nigeria are also organised by the Center for active participation of all member states in promoting space education.

It is in line with the United Nations General Assembly resolution 61/111 of 14 December 2006 that sort to promote cooperation, on matters of mutual interest related to civil satellite-based positioning, navigation, timing and value-added services, in order to ensure the compatibility and interoperability of global navigation satellite systems, while increasing their use to support sustainable development, particularly in developing countries that this training workshop is anchored. It is also to complement the series of such training workshops that the United Nations Office or Outer Space Affairs (UN-OOSA) along with her regional centres has been organising around the world especially the 2010 GNSS Workshop held here in Ile-Ife. The difference with this particular Workshop is that it is a direct collaboration between Regional Centres and an host University (Beihang University); creates opportunity to review the Beidou System and the planned extension to Africa; and in general review the recent developments in GNSS.

GNSS has now mainstream into our culture and our daily lives due to the availability of many products (e.g. smart phones, vehicle navigation system, etc.) and many other services on offer to the public.

To allow Africa benefit from GNSS promising applications such as efficiency and safety in transportation, search and rescue, geodesy, land management, oil and gas pipeline monitoring and control, location based applications, surveying for oil exploration and mining activities, maritime applications, and sustainable development, Nigeria successfully launched her first communication satellite NigComSat-1, in May 2007 and its replacement – NigComSat-1R in 2011. NigComSat-1& 1R has two navigation payloads on the L1 (1575.42 MHz) and L5 (1176.45 MHz) frequency bands that supports augmentation through the GPS L1, modernized GPS L5 and future GALILEO L1 and L5 navigation frequencies. The navigation payload has a C-band receiver antenna for receiving the two C bands (C1 and C5) uplink channels that will be further down-converted on-board the satellite to the two L bands (L1 and L5) downlink channels to augment GPS and GALILEO systems. This has elevated our country to the status of a regional navigation satellite systems provider.

Availability of the L-bands navigation pay loads in NigComSats, is in recognition of the specified global directions and applicable standard technologies provided by the International Civil Aviation Organization (ICAO) towards the required Communication Navigation and Surveillance (CNS) for all countries so as to achieve maximum automation and efficiency in airspace operations.

Nigeria has opened a robust horizon for the observation, adjustment and strengthening of Geodetic Control Network in Nigeria as part of the GNSS ground infrastructure. As part of her contribution to the African Reference Frame project (AFREF) the country GNSS Reference Network, was initiated in 2008 by the Office of the Surveyor General of the Federation (OSGOF). This network was established using state of the art Continuously Operating Reference Station (CORS) and Global Navigation Satellite System (GNSS) equipment to serve as a fiducial geodetic network for Nigeria. The primary aim of the project is to serve as the Zero Order Network that defines a new reference frame based on space geodetic techniques. It is a starting point towards migration to the global geocentric coordinates for the country. Currently over 25 CORS has been established across the length and breadth of Nigeria. The Nigeria GNSS Reference Network forms the basis for the national horizontal and vertical geodetic control for Nigeria named **Nignet**. The Network is fully consistent and homogeneous with the International Terrestrial Reference Frame (ITRF).

To successfully implement this initiative and for guides on the application areas, there is need for continuous capacity building and skills development of relevant professionals in the area of GNSS.

Therefore the objectives of the training workshop are to: (i) present updates on the status and plans for future developments of GNSS in Africa with particular reference to Beidou Navigation Satellite Systems; (ii) present the roles of Beidou in Augumentation Systems; (iii) present GNSS technology and its application in establishing geographical reference systems, transportation and communications, aviation, surveying, mapping and Earth science, management of natural resources, precision agriculture, the environment and disasters;(iv)   provide "hands on" experience on GNSS data to specific applications, (v) increase the knowledge and skills of professionals on the use of GNSS data, and (vi) strengthen regional information and data exchange networks on the use of GNSS technology.

Obafemi Awolowo University campus, Ile-Ife with her serene environment is the centre of culture and learning in Nigeria. Many space related institutions are established here, and it is a gathering of numerous scholars with outstanding scholastic prowess. The Organizing Committee of this workshop will make your stay here remarkable and we believe that every participant will enjoy a very beneficial training.

It is hoped that the course will provide a major platform for the enhancement of skills and skills transfer in this aspect of space technology and achieve some of the objectives and actions of the renewed partnership between Nigeria and China. It is also expected to further strengthen the foundations for the development of regional expertise in the area of GNSS applications as well as provide ample time for reflections and discussions on the issue and create networking opportunities for all participants.

Once again you are all welcome.

Ganiy I. Agbaje, PhD, fnis

Executive Director, ARCSSTEE